

## PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To:

PARK, Jang-Won

Jewoo Bldg. 5th Floor, 200, Nonhyun-Dong, Gangnam-Gu,  
Seoul, 135-010 Republic of Korea

PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing  
(day/month/year) **03 MARCH 2006 (03.03.2006)**

Applicant's or agent's file reference

PAKIST05255

FOR FURTHER ACTION

See paragraph 2 below

International application No.

**PCT/KR2005/003486**

International filing date (day/month/year)

**19 OCTOBER 2005 (19.10.2005)**

Priority date(day/month/year)

19 OCTOBER 2004 (19.10.2004)

International Patent Classification (IPC) or both national classification and IPC

*C30B 25/00(2006.01)i*

Applicant

**KOREA INSTITUTE OF SCIENCE AND TECHNOLOGY et al**

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

## 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.  
For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/KR



Korean Intellectual Property Office  
920 Dunsan-dong, Seo-gu, Daejeon  
302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Date of completion of this opinion

03 MARCH 2006 (03.03.2006)

Authorized officer

KANG, SANG YOON

Telephone No. 82-42-481-8155



**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/KR2005/003486

**Box No. 1 Basis of this opinion**

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.  
  
☐ This opinion has been established on the basis of a translation from the original language into the following language \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:  
☐ a sequence listing  
☐ table(s) related to the sequence listing
  - b. format of material:  
☐ on paper  
☐ in electronic form
  - c. time of filing/furnishing:  
☐ contained in the international application as filed.  
☐ filed together with the international application in electronic form.  
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/KR2005/003486

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

|                               |        |      |     |
|-------------------------------|--------|------|-----|
| Novelty (N)                   | Claims | 1-9  | YES |
|                               | Claims | None | NO  |
| Inventive step (IS)           | Claims | 1-7  | YES |
|                               | Claims | 8, 9 | NO  |
| Industrial applicability (IA) | Claims | 1-9  | YES |
|                               | Claims | None | NO  |

**2. Citations and explanations :**

Reference is made to the following documents:

D1 US 5334283

D2 US 5486263

D3 US 2002/168836 A1

D4 US 6068883

The present invention(henceforth PI) is a diamond shell with a geometrical figure and method for fabrication thereof. D1 describes an etching technique for use in making electronic devices such as semiconductor devices, and more particularly to a process of selectively etching diamond. D2 relates to the methods of etching, and more particularly to methods of removing material from a diamond body. D3 is directed to the method of producing a diamond film with lowered electric resistance can be produced, and also a diamond film produced by the method. D4 discloses a diamond film and a method of producing the same. More specifically, this invention relates to a diamond film suitable for a semiconductor layer and insulating layer in the electronics industry and the method of producing the same.

**1. Novelty and inventive step (claim 1-7)**

None of the cited reference discloses the technical features of a diamond shell with a geometrical figure and method for fabrication including steps of synthesizing diamond film on the matrix by CVD process and etching the matrix, nevertheless each of the cited documents includes selectively etching a diamond substrate comprising the steps of forming a graphitic area within a diamond substrate and selectively etching the diamond substrate with a gaseous reactant under conditions sufficient to convert the graphitic area to a gaseous product as in D1; a CVD diamond film etched by immersion of the body in a molten or partially molten metal, e.g. the rare earth metal La or Ce as in D2; a method of producing a diamond film formed on a substrate, wherein at least after a film (dopant layer) containing doping elements is formed on a surface of the substrate, a vapor phase synthetic diamond film is formed on the dopant layer, and the dopant layer contains diamond particles as in D3; a diamond film formed from growth nuclei distributed on a substrate at a density of at least  $10^{10}$  numbers/cm<sup>2</sup> by dispersing diamond grains of average diameter of no more than 0.1µm in an acid solution and distributing the grains on a substrate immersed in the solution by any means including ultrasonic vibration and voltage application as in D4.

(to be continued on supplemental box)

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/KR2005/003486

**Box No. VIII Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

The term "geometrical shape" used in claims 1, 7, 8 is vague and unclear and leaves the reader in doubt as to the meaning of the technical feature to which it refers, thereby rendering the definition of the subject matter of said claims unclear (PCT Article 6).

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/KR2005/003486

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.  
Continuation of:

PI is distinguishable, in comparison with others(D1-D4), in the respect of fabricating hollow diamond shell using the composites where a part is uncoated with a diamond film, as well as wouldn't be obvious to the person skilled in the art to apply these features.

Therefore, the subject matter of claim 1-7 in PI have not only the novelty required in PCT Article 33(2) but also the inventive step regulated in PCT Article 33(3).

**2. Novelty and inventive step (claim 8 & 9)**

D1-D4 discloses a process for selectively etching a diamond substrate as PI does. However, the claim 8 & 9 of PI includes the method of synthesizing diamond particles, which are not seen in D1-D4. Therefore, the claim 8 & 9 of PI meets the requirements of PCT Article 33(2) in respect of novelty.

In the light of invention components, the process for selectively etching a diamond substrate of D1 comprises forming a graphitic area within a diamond substrate and selectively etching the diamond substrate with a gaseous reactant under conditions sufficient to convert the graphitic area to a gaseous product, preferably while substantially avoiding reacting with the diamond of the diamond substrate corresponding to the steps of fabricating a diamond described in claim 8 & 9 of PI, whereas D1 doesn't have technical feature of synthesizing diamond particles in the comparison of claim 8 & 9 in PI. However, the difference in the above can be accomplished by the process of D1 easily by the skilled person. In other words, those features are merely one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill, in order to solve the problem posed.

Therefore, the subject matter of claim 8 and 9 does not involve an inventive step under PCT Article 33(3).

**3. Industrial Applicability**

A diamond shell with a geometrical figure and method for fabrication thereof is industrially applicable and fulfills the requirement of industrial applicability(Article 33(4) PCT).

## PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To:

PARK, Jang-Won

Jewoo Bldg. 5th Floor, 200, Nonhyun-Dong, Gangnam-Gu,  
Seoul, 135-010 Republic of Korea

PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing  
(day/month/year)

03 MARCH 2006 (03.03.2006)

Applicant's or agent's file reference

PAKIST05255

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/KR2005/003486

International filing date (day/month/year)

19 OCTOBER 2005 (19.10.2005)

Priority date(day/month/year)

19 OCTOBER 2004 (19.10.2004)

International Patent Classification (IPC) or both national classification and IPC

C30B 25/00(2006.01);

Applicant

KOREA INSTITUTE OF SCIENCE AND TECHNOLOGY et al

## 1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

## 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.  
For further options, see Form PCT/ISA/220.

## 3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/KR



Korean Intellectual Property Office  
920 Dunsan-dong, Seo-gu, Daejeon  
302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Date of completion of this opinion

03 MARCH 2006 (03.03.2006)

Authorized officer

KANG, SANG YOON

Telephone No. 82-42-481-8155



**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/KR2005/003486

**Box No. 1 Basis of this opinion**

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.  
  
☐ This opinion has been established on the basis of a translation from the original language into the following language \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material  
☐ a sequence listing  
☐ table(s) related to the sequence listing
  - b. format of material  
☐ on paper  
☐ in electronic form
  - c. time of filing/furnishing  
☐ contained in the international application as filed.  
☐ filed together with the international application in electronic form.  
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/KR2005/003486

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

|                               |        |      |     |
|-------------------------------|--------|------|-----|
| Novelty (N)                   | Claims | 1-9  | YES |
|                               | Claims | None | NO  |
| Inventive step (IS)           | Claims | 1-7  | YES |
|                               | Claims | 8, 9 | NO  |
| Industrial applicability (IA) | Claims | 1-9  | YES |
|                               | Claims | None | NO  |

**2. Citations and explanations :**

Reference is made to the following documents:

D1 US 5334283  
D2 US 5486263  
D3 US 2002/168836 A1  
D4 US 6068883

The present invention(henceforth PI) is a diamond shell with a geometrical figure and method for fabrication thereof. D1 describes an etching technique for use in making electronic devices such as semiconductor devices, and more particularly to a process of selectively etching diamond. D2 relates to the methods of etching, and more particularly to methods of removing material from a diamond body. D3 is directed to the method of producing a diamond film with lowered electric resistance can be produced, and also a diamond film produced by the method. D4 discloses a diamond film and a method of producing the same. More specifically, this invention relates to a diamond film suitable for a semiconductor layer and insulating layer in the electronics industry and the method of producing the same.

**1. Novelty and inventive step (claim 1-7)**

None of the cited reference discloses the technical features of a diamond shell with a geometrical figure and method for fabrication including steps of synthesizing diamond film on the matrix by CVD process and etching the matrix, nevertheless each of the cited documents includes selectively etching a diamond substrate comprising the steps of forming a graphitic area within a diamond substrate and selectively etching the diamond substrate with a gaseous reactant under conditions sufficient to convert the graphitic area to a gaseous product as in D1; a CVD diamond film etched by immersion of the body in a molten or partially molten metal, e.g. the rare earth metal La or Ce as in D2; a method of producing a diamond film formed on a substrate, wherein at least after a film (dopant layer) containing doping elements is formed on a surface of the substrate, a vapor phase synthetic diamond film is formed on the dopant layer, and the dopant layer contains diamond particles as in D3; a diamond film formed from growth nuclei distributed on a substrate at a density of at least  $10^{10}$  numbers/cm<sup>2</sup> by dispersing diamond grains of average diameter of no more than 0.1μm in an acid solution and distributing the grains on a substrate immersed in the solution by any means including ultrasonic vibration and voltage application as in D4.

(to be continued on supplemental box)



**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/KR2005/003486

**Box No. VIII Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

The term "geometrical shape" used in claims 1, 7, 8 is vague and unclear and leaves the reader in doubt as to the meaning of the technical feature to which it refers, thereby rendering the definition of the subject matter of said claims unclear (PCT Article 6).

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/KR2005/003486

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.  
Continuation of :

PI is distinguishable, in comparison with others(D1-D4), in the respect of fabricating hollow diamond shell using the composites where a part is uncoated with a diamond film, as well as wouldn't be obvious to the person skilled in the art to apply these features.

Therefore, the subject matter of claim 1-7 in PI have not only the novelty required in PCT Article 33(2) but also the inventive step regulated in PCT Article 33(3).

**2. Novelty and inventive step (claim 8 & 9)**

D1-D4 discloses a process for selectively etching a diamond substrate as PI does. However, the claim 8 & 9 of PI includes the method of synthesizing diamond particles, which are not seen in D1-D4. Therefore, the claim 8 & 9 of PI meets the requirements of PCT Article 33(2) in respect of novelty.

In the light of invention components, the process for selectively etching a diamond substrate of D1 comprises forming a graphitic area within a diamond substrate and selectively etching the diamond substrate with a gaseous reactant under conditions sufficient to convert the graphitic area to a gaseous product, preferably while substantially avoiding reacting with the diamond of the diamond substrate corresponding to the steps of fabricating a diamond described in claim 8 & 9 of PI, whereas D1 doesn't have technical feature of synthesizing diamond particles in the comparison of claim 8 & 9 in PI. However, the difference in the above can be accomplished by the process of D1 easily by the skilled person. In other words, those features are merely one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill, in order to solve the problem posed.

Therefore, the subject matter of claim 8 and 9 does not involve an inventive step under PCT Article 33(3).

**3. Industrial Applicability**

A diamond shell with a geometrical figure and method for fabrication thereof is industrially applicable and fulfills the requirement of industrial applicability(Article 33(4) PCT).